

Energy Storage Controls and Hybridization Related Efforts at PNNL

**Presented by
Jan Alam**

**Contributors:
Sarmad Hanif, Bilal Ahmad Bhatti, and Roshan Kini**



DOE Energy Storage Program Annual Peer Review

26th to 28th October 2021

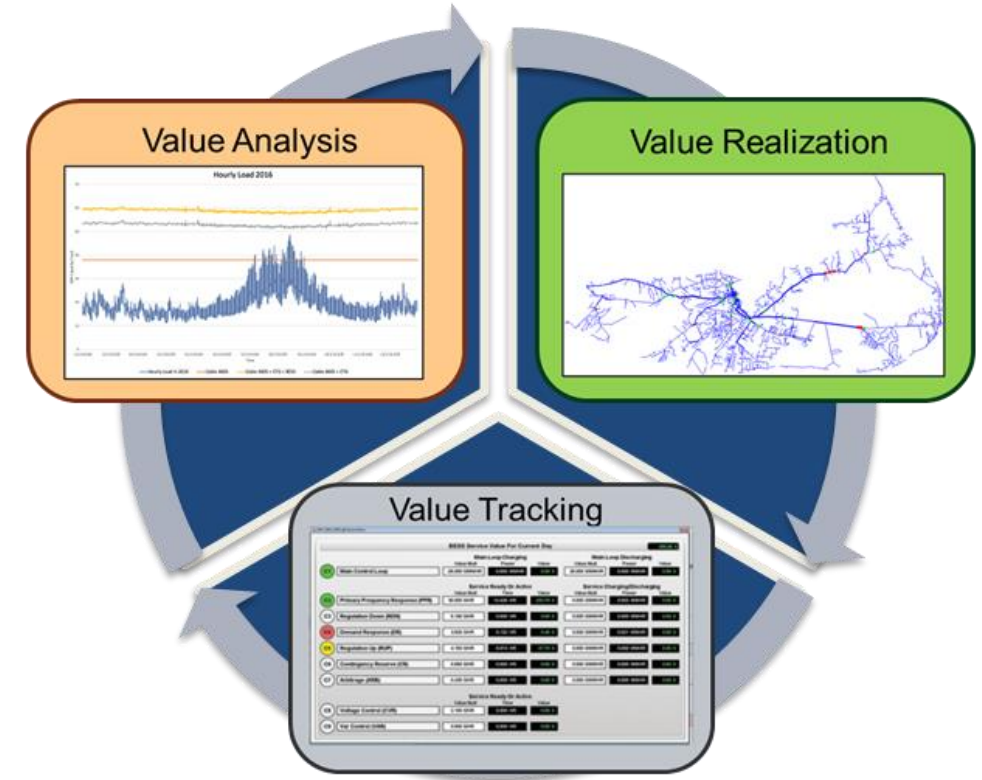
Presentation ID: 802

Agenda

- Background and Motivation.
- Overview of Energy Storage Controls and Hybridization Related Projects at PNNL.
- FY 21 Activities and Outlook.
- Acknowledgement.

Background and Motivation

- Grid energy storage (ES) industry leaving the infancy stage – more than a decade since the early-stage demonstration projects.
- ES community aware of financial and economic opportunities – valuation models and techniques evolving.
- Natural next step is a community-wide effort on enabling the most effective control and deployment strategies to realize the benefits of energy storage.
- Important to explore ‘next’ opportunities as the ‘low hanging fruits’ are being enjoyed.



**PNNL Industry Acceptance Program
Actively Supports the
Energy Storage Value Chain**

Overview of Energy Storage Controls and Hybridization Related Projects at PNNL

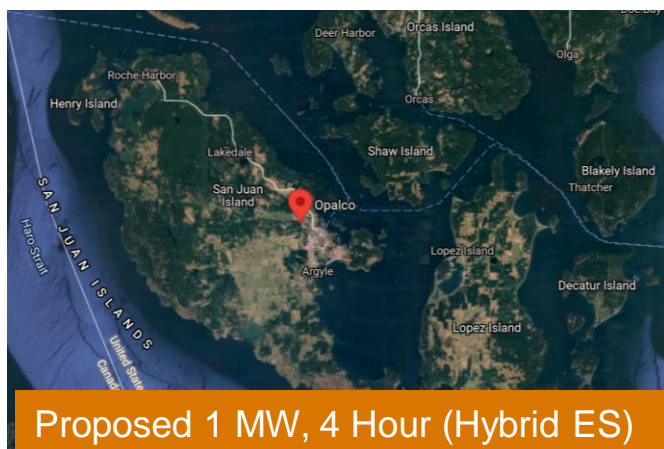
2018-Ongoing | PGE | T&D and Hybrid



2019-Ongoing | EWEB | BTM and Hybrid



2018-2020 | NG | T&D and Market



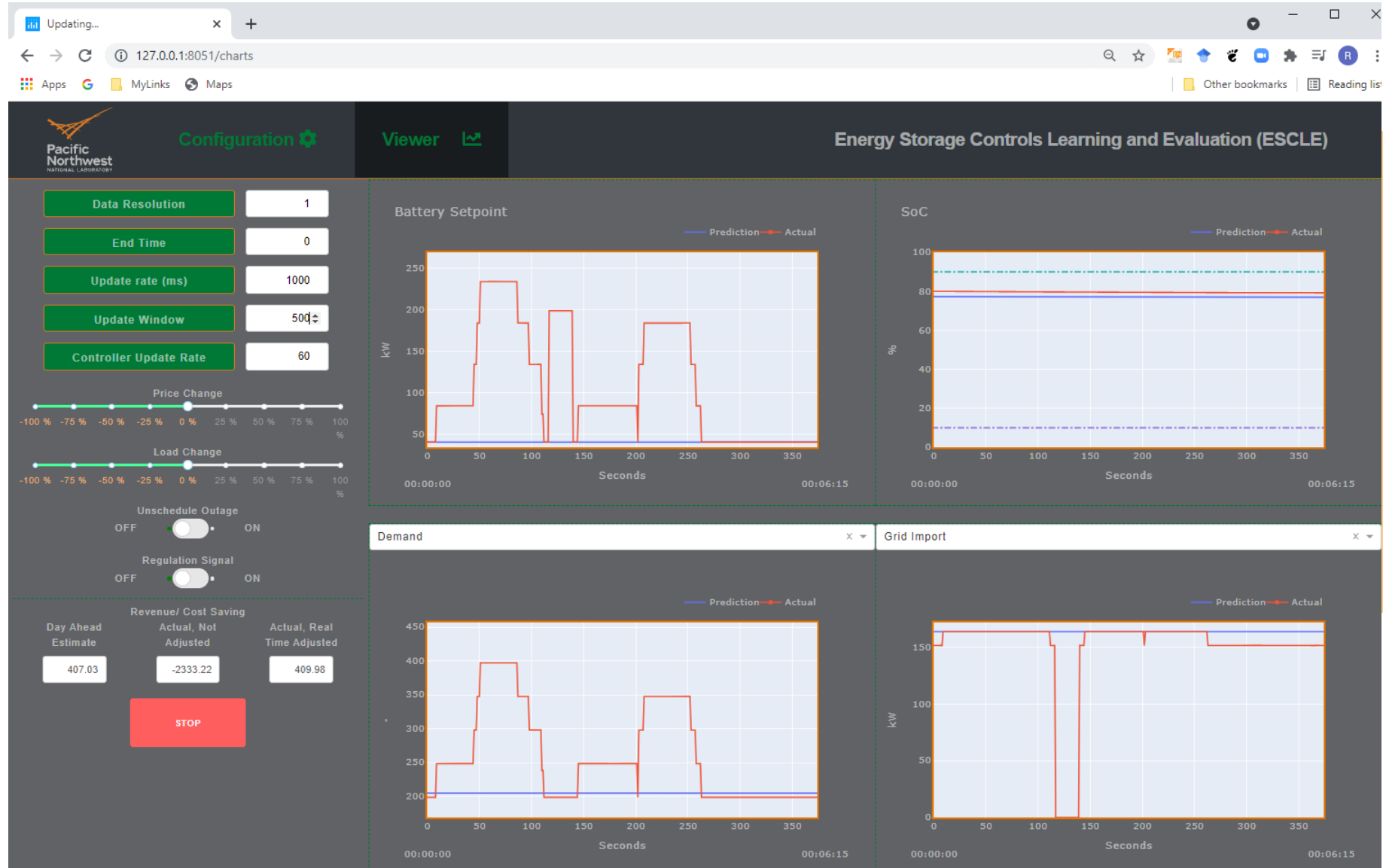
PNNL Energy Storage Publications

- <https://energystorage.pnnl.gov/publications.asp?pa=gridPubs>
- <https://www.sandia.gov/ess-ssl/lab-pubs/pacific-northwest-national-laboratory-pnnl-publications-2/>

2021-Ongoing | OPALCO | Distribution Grid

2021-Ongoing | PSE | Distribution Grid

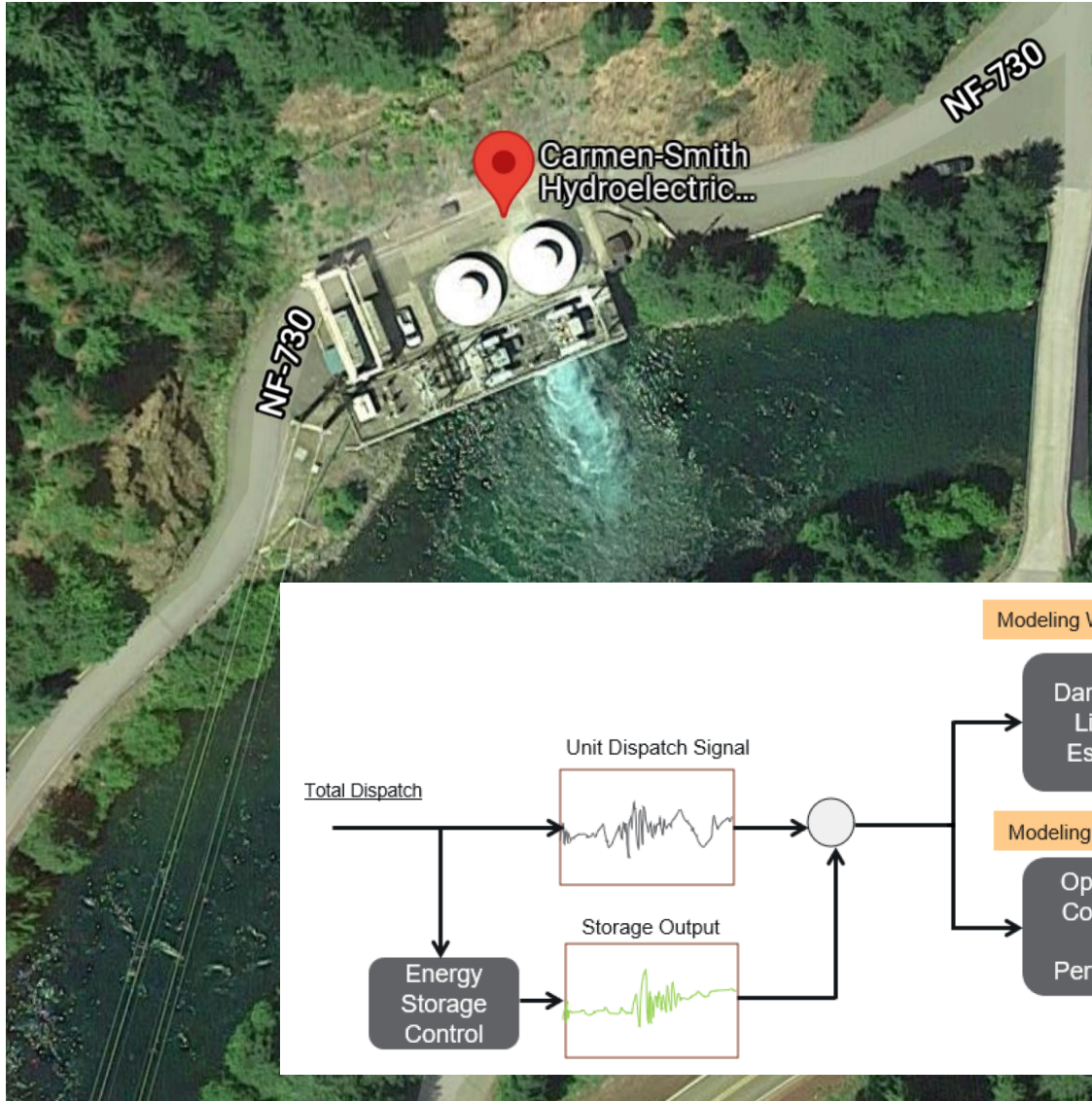
Toolkit for Energy Storage Controls Learning and Evaluation (ESCLE)



Outlook

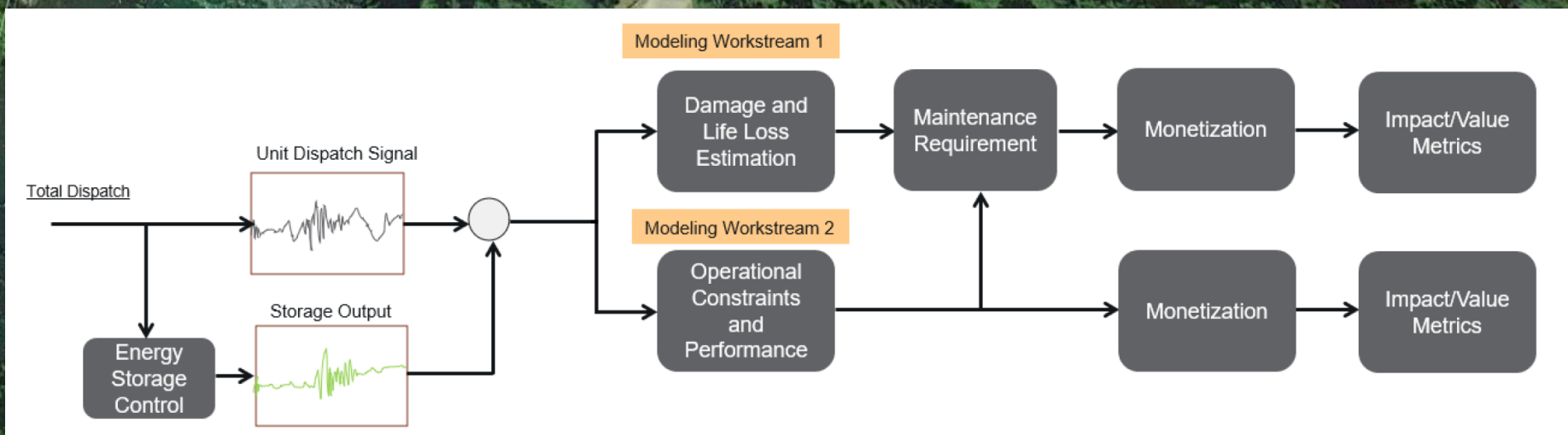
- Packaging resources in a re-useable format.
- Expanding use case library with new experience.
- Incorporate user feedback.
- Release as an open-source tool.

Hybrid Operation of Conventional Resources with Energy Storage

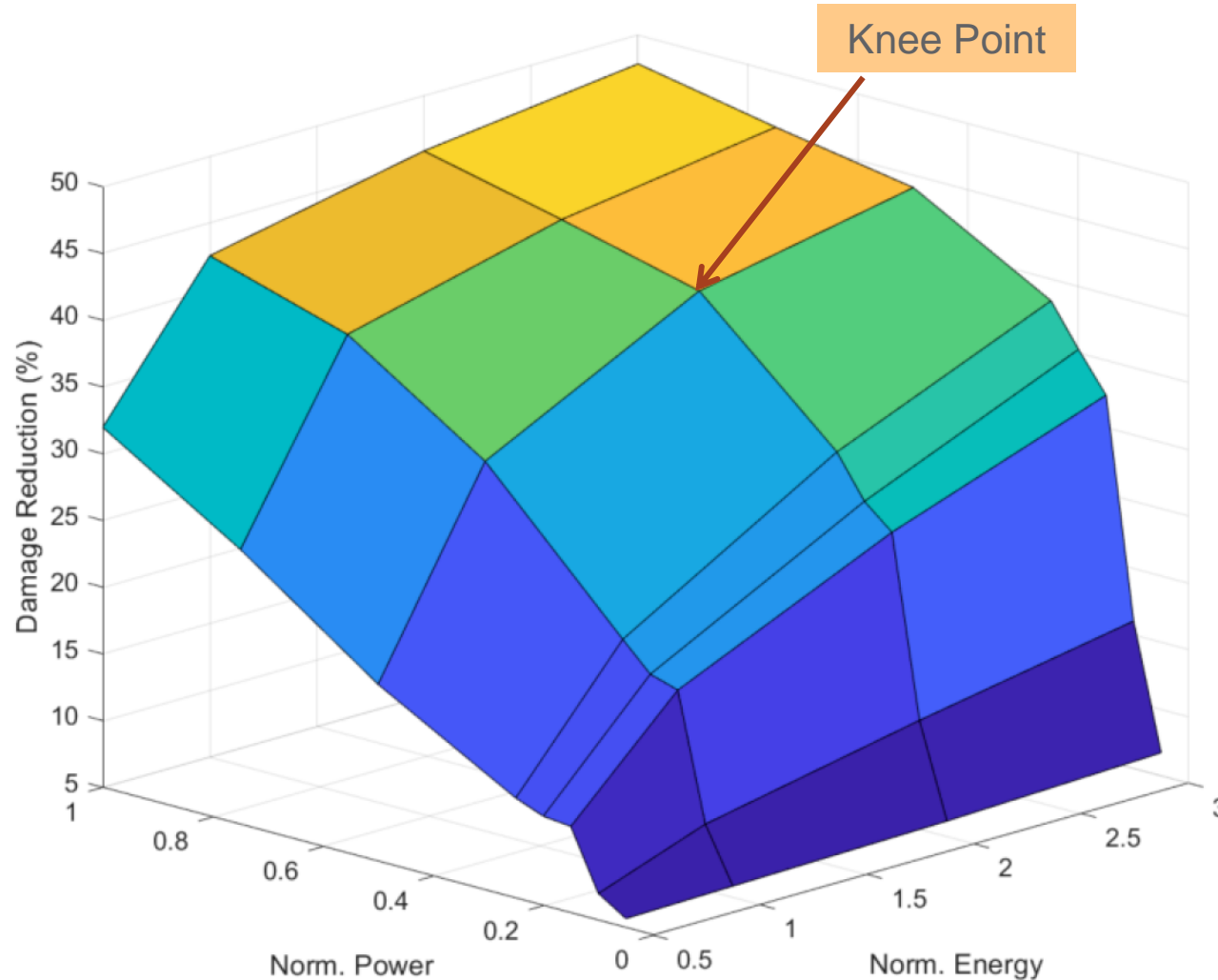


EWEB Carmen-Smith Hydropower Plant

- 2 x ~50 MW Francis Turbines.
- Meets the 'flexibility' needs of the system.
- Operating 'smoothly' and avoiding 'rough zones' may extend asset life.
- Energy storage could help.



Damage Reduction of Hyrdo Turbines through Energy Storage Supported Hybrid Operation



Outlook

- Model and co-optimize additional use cases, including EIM participation.
- Improve asset maintenance, damage, and life models.
- Incorporate environmental and FERC license constraints.
- Package as a re-usable capability for other conventional assets.



Acknowledgement



Dr. Imre Gyuk, Office of Electricity, U.S. Department of Energy



Clean Energy Fund, Washington State Department of Commerce

Questions and Comments

Jan Alam, Jan.Alam@pnnl.gov | Sarmad Hanif, Sarmad.Hanif@pnnl.gov | Vince Sprenkle, Vincent.Sprenkle@pnnl.gov